Volume status and fluid responsiveness

ASSESSING FLUID TOLERANCE

Ultrasound can help guide a plan for intravenous (IV) fluid resuscitation in the critically ill.

An integrated approach is most effective, with serial scans of the heart, lungs, and inferior vena cava (IVC).

Heart

Evaluate systolic function to assess the ability of the left heart to use more preload. Patients with reduced ejection fraction may benefit from IV fluid, but be less tolerant of high-volume resuscitation. Examine the right heart to assess its ability to tolerate fluid. Patients with right ventricular overload (e.g., in massive pulmonary embolus) may develop worsening hypotension with IV fluid.

Lungs

Perform lung ultrasound to check for B lines, pleural effusion, or consolidation. Serial scans can show the development of pulmonary edema if B lines develop with fluid administration.

IVC

Assess the IVC diameter and collapsibility. A small (< 1.5 cm), collapsible IVC suggests fluid tolerance. Consider the IVC results in light of the echo findings; a patient with an obstructive cause of shock (e.g., pericardial effusion, pulmonary embolus) should have pressure transmitted to the IVC, with increased diameter and decreased collapse.

Practical approach

Perform point-of-care ultrasound for patients with suspected shock or critical illness on arrival in order to obtain diagnostic information, and to shape your impression of volume status prior to resuscitation. Patients with normal cardiac function, no B lines, and a small IVC should be fluid tolerant.

Perform serial scans of the lungs and IVC if there is persistent hypotension or if the patient becomes dyspneic or hypoxic. The development of B lines and increasing IVC diameter may prompt initiating vasoactive support.

Benefits

Ultrasound guided volume status has been shown to have a range of benefits:

Decreased
intravenous fluid use

Increased
vasopressor use

Decreased
mortality